

and at the same time the most complete, is further illustrated by seven large folding lithographed plates. These are bound at the end of the volume.

Suffice it to say that this piece of work is a matter for congratulation to Prof. Disselhorst, and its publication a credit to all concerned.

FRANCIS H. A. MARSHALL.

SPECTRUM ANALYSIS.

An Introduction to the Study of Spectrum Analysis.

By W. Marshall Watts, D.Sc., F.I.C. Pp. vii+325. (London: Longmans, Green and Co., 1904.) Price 10s. 6d. net.

IT is somewhat remarkable that, in spite of the great interest and importance of the subject, there are few, if any, text-books on spectrum analysis which really meet the requirements of beginners who desire to take up the matter practically. The announcement of an introductory work by the well-known compiler of the "Index of Spectra," however, led to the hope that this gap in the literature of the spectroscopy would at last be adequately filled, but it is disappointing to find that the needs of the practical student are again almost disregarded.

The book includes a brief account of the optical principles underlying the different forms of spectroscopy, and general explanations of the methods of producing and mapping spectra, besides which there are short statements relating to the arrangement of lines in series, and the applications of the spectroscopy to the study of the heavenly bodies. When it is stated that nearly half the book is occupied by wave-length tables, and that there are 135 illustrations—many of them large ones—it will be seen that the general treatment can scarcely be otherwise than sketchy. The descriptions of the modes of procedure are consequently often lacking in details which would have been of the greatest use to the student. Thus, with reference to the spectra of gases, the only method of observation indicated is that of a ready-made Geissler tube, which, as the author remarks, does not always show the spectrum of the gas present in the greatest proportion; it would have been useful to explain how the student might examine the spectrum of a gas collected or prepared by himself. Later on, there is a short account of stellar spectra, but no directions whatever as to how such a spectrum may be observed.

Another very serious defect from the student's point of view is the use of the arbitrary scale of Bunsen in the maps and earlier descriptions of the characteristic lines of the different elements. It is afterwards shown how such measurements may be reduced to wave-lengths, but surely it would have been better to define the various lines by their wave-lengths from the very beginning; as it stands, a great deal of unnecessary labour is involved in the comparison of the descriptions and maps with the wave-length tables given at the end of the book.

The book, in fact, leaves a great deal to be

desired, whether considered as a laboratory guide or as a descriptive work. Many important facts are left unnoticed, though space might have been found for some of them by the omission of superfluous or insufficiently described illustrations. In the section on nebulae, for instance, there are no less than eight diagrams showing the telescopic appearances of these objects, but no reference to the fact that all nebulae do not exhibit bright line spectra; the reader is, moreover, likely to get the wrong impression that the chief nebular line is due to nitrogen.

Though brought well up to date in some respects, the book is far behind the times in others. It is erroneously stated (p. 106) that the spectrum of the solar corona includes lines of helium, hydrogen, and calcium, and the important subject of enhanced lines in relation to many celestial spectra is overlooked altogether.

Many other examples of the shortcomings to which attention has been drawn might be given, but the above will sufficiently indicate that the selection of material has not been judiciously made. By far the most valuable feature of the book is the series of abridged tables of wave-lengths, showing the more important lines in the spectra of nearly all the known chemical elements.

OUR BOOK SHELF.

Text-books of Physical Chemistry.—Electrochemistry. Part i. General Theory. By R. A. Lehfeldt, D.Sc. Pp. viii+268. (London: Longmans, Green and Co., 1904.) Price 5s.

STUDENTS of physical chemistry have to-day no cause to complain of a dearth of books upon the subject. There are a considerable number of large volumes treating of this branch, and now we have the series of text-books edited by Sir William Ramsay. The book under review is the second of the series, and has been entrusted to Dr. Lehfeldt, who is well known as a worker on the physical side of electrochemistry.

Dr. Lehfeldt has not followed any hard or fast line laid down by previous writers upon the subject, and for this reason the book may be read with more than ordinary interest. The book is divided into three chapters, which might perhaps better be designated parts i., ii., and iii. Chapter ii. is written by Mr. T. S. Moore, and deals with the relation of chemical constitution to conductivity. This chapter is very carefully thought out and arranged, and the author has consulted the latest literature. It deals, in the first place, with the relation of charge carried to constitution, this portion being really a repetition and enlargement of what has already been dealt with in the previous chapter. In fact, chapter ii. is to a certain extent an addendum to the first chapter, but it should in no wise be skipped by the student who desires to comprehend the bearing of electrochemistry on chemical problems. Other points treated in this chapter are relation of the number of ions in solution to constitution, pseudo acids and bases, amphoteric electrolytes, and so on.

Chapter i. commences with a description of certain voltameters. We would rather that the author had adopted the term coulometer, because the instruments are for measuring current and not potential.

although, of course, the author is only using the term commonly applied to these instruments.

Dr. Lehfeldt then discusses the mechanism of electrolytes. We are not sure what a certain school of chemists will say to the following rather didactic statement:—

"It was Arrhenius who first put forward reasons for supposing that an electrolyte might be largely, . . . dissociated in solution . . . this view has gradually gained support from experiment since, and may be looked upon as thoroughly established."

Dr. Kahlenberg, for instance, would hardly subscribe to this statement. In this chapter the author also deals, among other subjects, with the conductivity of the electrolyte, ionic velocities, and electrolysis in non-aqueous solutions.

The last chapter is devoted to the theory of chemico-electromotive force. The section on thermodynamic theory and the calculation of electromotive force of a voltaic cell well repays perusal, as does the section on standard cells.

Dr. Lehfeldt is thoroughly at home with his subject; we are not, however, sure whether the average student will find the style very interesting. Of course, a book of this kind cannot be read in a cursory way; if it could, we doubt whether it would be worth reading, but we are of the opinion that it will be welcomed by all interested in the subject.

Traces of the Norse Mythology in the Isle of Man.

By P. M. C. Kermode. Pp. 30. (London: Bemrose and Sons, Ltd., 1904.) Price 2s. 6d.

IN this work Mr. Kermode, whose name is well known in connection with Manx archæology, has printed a lecture delivered to the Antiquarian Society of his native island in December of last year. The Isle of Man contains a large number of cross-bearing grave-stones, which, as the inscriptions clearly show, belong to the period when the Scandinavian element was predominant in the island. It is not improbable that in some cases the symbols on these stones may refer to the old Scandinavian mythology rather than to Christian belief and legend, and Mr. Kermode has endeavoured to determine how far this is the case. After a very brief sketch of the Scandinavian settlements in the west, and more especially in Man, a short account is given of some leading details of the old Norse mythology as preserved in the Eddas. Both here and in the following section an interest in the subject is sometimes more evident than familiarity with it in all its bearings. It is, for example, quite erroneous to state that "of the seven days of the week all but the first two are called after Scandinavian gods." Even on his own lines, Mr. Kermode cannot thus account for *Saturday*, and a closer study of the old English forms would have shown him the true origin of the other names. The influence of the Scandinavian tongues on English has been very great, but it requires a close study of philology to decide the particular cases in which it appears.

The concluding section consists of a detailed description of the illustrations, under eight heads, and with references to the ten plates at the end of the booklet. These are neatly executed, and exhibit typical specimens of Celtic crosses and ornamentation, as well as the symbolic figures which Mr. Kermode believes to represent subjects taken from the old mythology. In many cases the explanation he offers is extremely doubtful, as there is always an equal, if not greater, possibility that the symbols are of Christian origin. Thus, what Mr. Kermode takes to be an eagle (=Suttung) pursuing a falcon (=Odin), might equally well, for all one can see, represent

Noah's raven and dove. The harper whom he identifies with the "gladsome Eggthér" of *Völuspá* may just as well be King David; and if the fish is a Christian symbol on Plate X., why not also on Plate III.? In many of these cases it is probably hopeless to determine what the sculptor had in his mind, and there is no particular gain in making guesses at it.

In minor points there is not always as much precision as is desirable. The Icelandic words and names are too frequently misprinted, while such equations as *Hnikarr* and *nykr*, *Ríg* and *Eirík*, are evidence of shaky philology. Mr. Kermode's lecture, however, may be of service in helping to waken or encourage interest in that Scandinavian influence on Britain which is an important factor in the history of our country.

W. A. CRAIGIE.

Eton Nature-study and Observational Lessons. Part ii.

By M. D. Hill and W. M. Webb. Pp. xvi+174. (London: Duckworth and Co., 1904.) Price 3s. 6d. net.

PART ii. of this book, like part i., is excellent. That nature-study as here recommended is educationally sound is beyond dispute. What makes instruction so wearisome to the learner is often, to put it plainly, the unceasing sound of the schoolmaster's voice. What a boy, if he has any go in him, wants, is to do something for himself. It would be best if he could make out everything unaided. "I never tell my pupils anything," once said a mathematician devoted to the maieutic method; and Hesiod quaintly remarks, "The best man of all is he who finds out everything for himself." But this is hardly possible for us moderns, and the authors of this book are wise enough not to make a craze of a sound principle. In the chapters, to take examples, on earthworms, woodlice, the defensive armour of plants, and plants that have no flower, there is plenty of information given to stimulate interest. If the pupil is the right kind of boy, he will be keen to follow some of the lines of investigation pointed out. Many persons are led to the out-of-doors study of natural history by reading. They want to see some of the wonderful things that naturalists have seen, not always to get them at second hand. Indeed, the importance of reading in connection with observation should be insisted on. Many boys, though full of zeal, never get beyond a very restricted field in natural history, because they will not read in order to discover how the little that they have learnt by the use of their own eyes finds its place in the vast accumulation of knowledge. The observer should be a reader, and the reader an observer.

A great deal may be learnt by trying the experiments recommended in this book, e.g. by hatching trout eggs, by keeping a fresh-water aquarium or an observatory hive of bees, by making a formicarium, by photographing such things as birds and birds' nests. But here a difficulty arises. At school, how is a boy to keep an observatory hive of bees or to hatch trout eggs? In fact, some of the suggestions bring out sadly the limitations of school life. Others, no doubt, are quite possible. But headmasters might well study a book like this. If teaching is to proceed on a truer and more natural plan than hitherto, something must be done to remove existing restrictions.

The subjects for observation (e.g. a frog's egg, a hen's egg, the development of tadpole and chick, a silk worm, an opening flower) are well chosen. The illustrations are all good. Some of the photographs ought to induce boys to make their photography a help to accurate observation instead of a mere amusement.